INFORMATION PAPER

CEIM-L
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SUBJECT: Software Test and Evaluation Panel (STEP) Metrics

1. Purpose. To provide information on the STEP Metrics as it applies to automated information systems in the US Army Corps of Engineers (USACE).

2. Facts.

a. Measure Performance is the fourth business process among the 39 business processes performed by USACE.

b. Metrics are measures of performance against which project managers can determine progress, assess trends, and proactively manage their projects.

c. Software development, testing, and evaluation, as commonly practiced, had been lacking a disciplined, measured engineering management process.

d. The Software Test and Evaluation Panel (STEP) was chartered by the Vice Chief of Staff of the Army in 1989 to analyze the problem and recommend solutions. The panel came up with a set of measures that could serve as progress indicators to allow the manager to foresee problems and tackle them while they were still manageable.

e. The STEP Metrics are described fully in DA Pamphlet 73-7, Software Test and Evaluation Guidelines, February 1996. The Department of the Army has defined the following 14 metrics as applicable to all software (code generated or COTS) which is being developed or modified.

(1) Cost. This tracks software expenditures by comparing the amount spent against the amount allocated.

(2) Schedule. This tracks adherence to the project schedule by reporting actual progress and milestone slippages.

(3) Computer Resource Utilization. This tracks planned and actual use of resources by reporting on the percentage of resource capacity utilized by the system.

(4) Software Engineering Environment. This metric is used to rate the level of maturity or sophistication of the system developer's software engineering principles by assessing the methodology, tools, experience, and other pertinent factors as recommended in the Capability Maturity Model developed by the Software Engineering Institute at Carnegie Mellon University.

(5) Manpower. This indicates the developer's application of human resources to the development program and the developer's ability to maintain sufficient staffing to complete the project.

(6) Development Progress. This indicates the degree of completeness of the software development effort. It can also be used to judge readiness to proceed to the next stage of software development.

(7) Requirements Traceability. This traces the linkage between the functional requirements to the software products including design and code and reports on the percentage of requirements traced from the function to the test case.

(8) Requirements Stability. This tracks changes to the functional requirements and plots the cumulative number of change requests over time against the number of requests that have been resolved.

(9) Complexity. This metric is used to assign a level of complexity to the software being developed for the AIS. The goal is to achieve a low level of complexity as much as possible.

(10) Breadth of Testing. Sometimes called "black box" testing, this addresses the degree to which required functionality has been successfully demonstrated as well as the amount of testing that has been performed.

(11) Depth of Testing. Sometimes called "white box" testing, this shows the extent and success of testing from the point of view of coverage of possible paths and conditions within the software.

(12) Fault Profiles. This tracks the number of detected errors in the software against the number that have been resolved. It also measures the average length of time it takes to solve the problem.

(13) Reliability. This measures down time for the system, mean time between failures, and restoration time. It can indicate how the software can contribute to mission failure.

(14) Design Stability. This tracks changes to the design of the software as well as how the completeness of the design is advancing over time.

f. DoD Regulation 5000.2-R requires the Project Manager to address six management issues regarding the status of an AIS. This can be accomplished with the use of the appropriate metrics as tabulated below:

Issues	Metrics
Schedule and Progress	Cost Schedule Development Progress
Funding and Personnel Resources	Cost Manpower
Growth and Stability	Requirements Traceability Requirements Stability Design Stability Complexity Computer Resource Utilization
Product Quality	Complexity Breadth of Testing Depth of Testing Fault Profile Reliability
Software Development Performance	Software Engineering Environment Development Progress
Technical Adequacy	Requirements Traceability Development Progress Complexity

g. Five metrics are required by the USACE Deputy Commanding General for all USACE AIS projects that cost $2.5M or more to develop and deploy. Their use is also recommended for any Corps-wide standard AIS. These metrics are: Cost, Schedule, Requirements Stability, Design Stability, and Breadth of Testing. In addition to these five, the use of the Requirements Traceability metrics is strongly urged by the Life Cycle Management Division.

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